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ABSTRACT

The task of social theory and especially of general social dynamics is to perceive patterns and regularities in our image of the four dimensional structure consisting of all human beings as they occupy three dimensions of space and one of time. Although the existing divisions of the social sciences exist for good historical reasons, there is a conceptual scheme for the study of the social system with the social sciences broken differently. The critical question, however, is whether it is possible in the next 50 years to mobilize an intellectual resource behind the problem of developing a general interdisciplinary social science. To parallel this there is the possibility that an amalgamation of history and geography would provide more refined study and improvement of the record of the space-time continuum. (Author/VLW)

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GENERAL SOCIAL DYNAMICS AS A FRAMEWORK FOR THE STUDY OF THE SOCIAL SYSTEM

BY

KENNETH E. BOULDING

The social system consists of that part of the total history of mankind which is interesting to the student of social systems. This is an accurate definition but like many accurate definitions, it needs a great deal of spelling out before it is very illuminating. The basic raw materials of the social system consist of everything that has ever happened to every human being who has ever lived. This is a pretty large mine. The knowledge industry like the mining industry is engaged very largely in throwing things away. Knowledge is gained by the orderly loss of information just as metals are gained by the orderly loss of dross. The situation is complicated by the fact that whereas the raw materials consist of events or objects in the four dimensional space-time continuum, with three dimensions of space and one dimension of time, what is available is only the record at the present moment. It is this which is brought to the surface of the present from the mine shaft of history and it represents not only a very small sample but a very biased sample of the enormous mountain of the past. Small as it is, the record is still too large for any single mind to contemplate and it must be processed and refined perhaps in many stages before it can be comprehended. The task of social theory, however, is precisely the refinement and the condensation of the record of the past to the point where it can be comprehended. This record is not, of course, stationary. It grows all the time under the impact of archeological and literary discoveries. The past is constantly changing - that is, our record of it, and our images and concepts of it must change likewise. The excavations of Jericho, the discovery of the Dead Sea scrolls, the discovery of old manuscripts

SO 001 724

in forgotten attics constantly enlarges the record and forces us to revise our images.

The task of social theory and especially of general social dynamics is to perceive patterns and regularities in our image of the four dimensional structure consisting of all human beings as they occupy three dimensions of space and one of time. It involves human beings in their societal rather than their biological aspect; we shall return to this distinction later. The concept of the four dimensional structure can be visualized most easily if we reduce it to three dimensions, two of space and one of time. Fortunately, this does not do a great deal of violence to the reality, because most human activity takes place on a surface, the surface of the earth, which can be easily be represented by a flat map. Up to date, at any rate, the third dimension of space has not been very much in use, even though strictly a man's position must be identified in four dimensions - that is, latitude, longitude, altitude, and time. The variations in the altitude dimension are quite small by comparison with the others, and we do not need to worry about them much at least until space exploration gets well under way.

We can suppose, therefore, that at any moment of time the social system occupies the surface of a sphere which I have called the "sociosphere" by analogy with the lithosphere, the hydrosphere, the atmosphere, and the biosphere. The interrelation of all these spheres forms the total system of earth and for many purposes this must be considered as a total system. However, there are systems levels defined mainly by degrees of complexity as we move from the rocks toward man and society and each systems level has a set of patterns of its own which makes it legitimate to regard it as a separate department of study. We must always remember however that departments of study are set up for our convenience not because the world itself is necessarily so divided. It should, indeed, be one of the major tasks of liberal education to give the student a concept of the total world system so that he can see, for instance how the sociosphere affects the sphere of physical matter through mining, building dams, polluting the atmosphere and so on. Similarly, the biosphere as it evolves new forms of life changes both the sphere of inanimate matter and the sociosphere. Nowadays the sociosphere has become almost dominant and is creating enormous changes, both in the biosphere as man changes the whole ecological pattern of the earth, in the atmosphere as man pollutes it and increases the carbon dioxide content, in the hydrosphere as man pollutes waters and changes the composition of the ocean and even in the lithosphere as man's activity mines ore, erodes soils, muddies the rivers, and pockmarks the earth with bombcraters.

The concept of space-time pattern is illustrated in Figure 1 in which we have a rectangular box in which time is measured from T_0 to T_3, latitude is measured from T_0 to A_0 and longitude from T_0 to C_0. At any moment of time such as T_0 we have a plane represented by the rectangle $T_0A_0B_0C_0$, on which we can draw a map of the world in as much detail as we wish. If we could imagine a map of the world drawn for each moment of time on a glass plate and then the plates stacked in the order in which they occur, we would get a solid pattern as in Figure 1, which represents a space-time continuum. In the figure, only four of these "plates" are drawn, T_0, T_1, T_2, and T_3. In fact, of course, they are stacked continuously. A human being or any object having persistence through time would be represented in such a figure by a kind of "worm" such as $H_0H_1H_2H_3$. His movements in space would be represented by wiggles in his space-time line. If we take the life of a single human being, it will originate at a certain latitude and longitude in the act of conception as a single fertilized cell. This

Figure 1

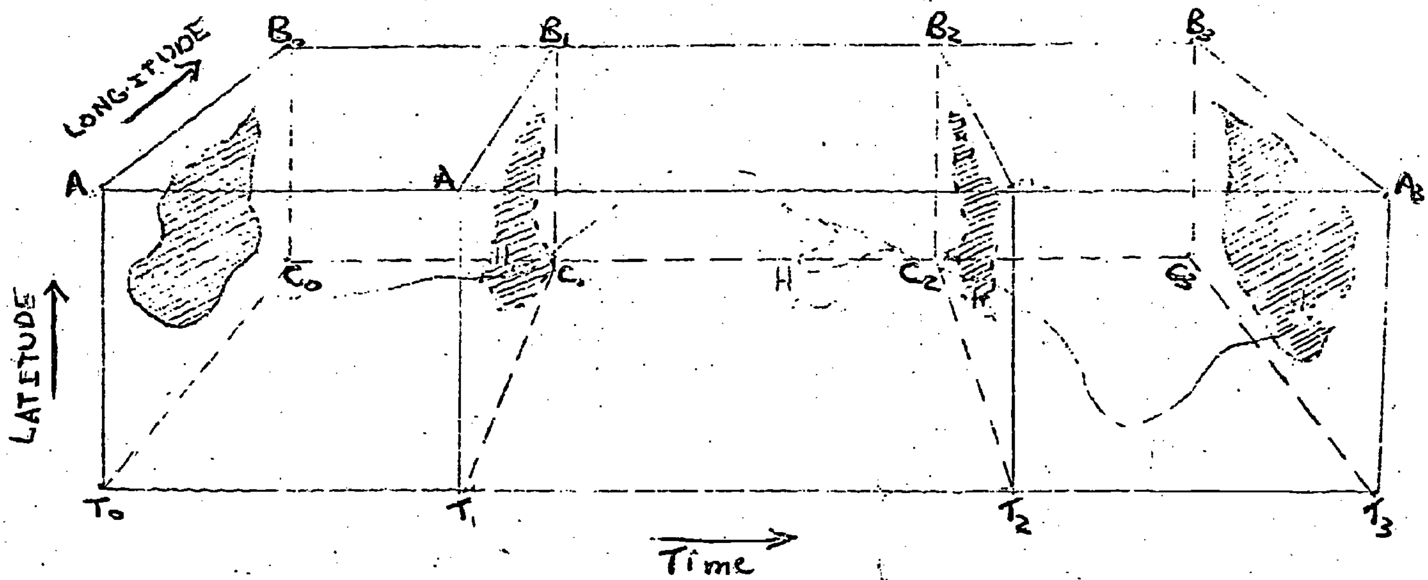
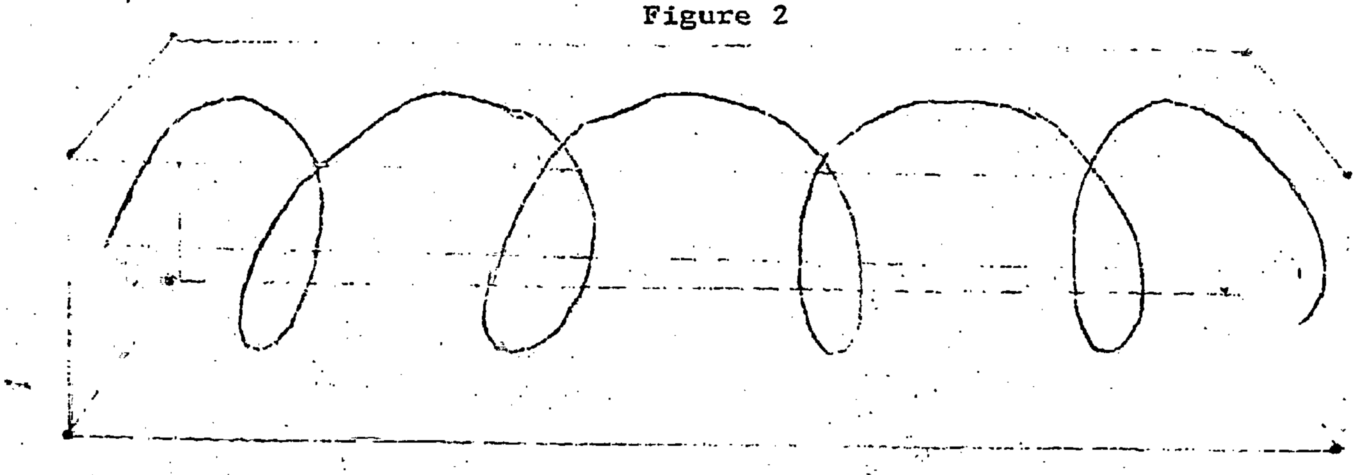


Figure 2



will grow into the baby, a child, a man, expanding somewhat in space as it grows, as it is becoming a "fatter" worm in the space-time figure and will then finally disappear as it dies. We can make similar space-time diagrams for countries, for buildings, or for any other organization or object in the social system, or for that matter in an other system, as what we are really representing in Figure 1 is a space-time pattern of a total earth, for all the other spheres also exhibit these space-time structures. The pattern that emerges then is a very complicated crystal structure in space-time and "dynamics" consist merely in the longitudinal patterns of this structure in the time dimension. What we have really done essentially here is to reduce time into another dimension of space. The difference between time and space, and the difference is a real one, is reflected simply in the nature of the patterns of "crystal structure" of our space-time crystal. The great difference between time and space of course is that a movement of space is reversible whereas a movement in time is not. This is reflected in the fact that the space-time pattern of an object such as H_0H_3 in Figure 1 can move any way in the space dimensions but can never return itself in time. That is, it could never have a shape like the dotted loop at H_n. We should note also that for some purposes representation of a sphere by a flat map such as in Mercator's projection can do some violence to reality. If, however, we keep in mind that on the sphere the line C_0B_θ is the same as line as T_0A_0, we should not get into much trouble.

Any kind of theory consists of the perception of regular patterns in the space-time continuum. These may be of a number of different kinds. The simplest kind is where the space-time solid such as the line H_0H_3 can be described by a mathematical equation. This can only be done where the regularity is so intense that the properties of a minute portion of the

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line (or solid) are repeated at all of the points of the line. Thus, if we were to suppose that Figure 1 represented the motion of the earth on the sun with the planes such as $T_0A_0B_0C_0$ represented, the plane of the earth's orbit or the ecliptic motion of the earth around the sun would be represented by a semi-elliptical spiral as in Figure 2, the path of the sun itself being dotted line S_0S_1. Celestial mechanics is simply the formulation of the equations of certain systems of this kind. These might be called "difference systems", as they are described by means of difference equations (or diffenential equations which are practically the same thing). We have a difference system of the first degree, if the difference between tomorrow and today is always the same, or more generally, if there is a constant functional relation of some kind between the system tomorrow and the state of the system today. If we know this relationship, and we know the state of the system today we know we can predict its state tomorrow, knowing its state tomorrow and applying the same relationship we can predict its state the day after tomorrow and so we can go on indefinitely either into the future or into the past. A very simple example of a difference system would be growth at a constant rate, let us say a sum at compound interest. Suppose, for instance, that the constant relation between today and tomorrow is that tomorrow is a constant proportion of today. Let us say, for simplicity, that whatever is the size of the thing today it will be double that size tomorrow. Then we know that the day after tomorrow that it will be four times the size it was today, the day after that it will be eight times, the day after that sixteen times, and so on. We know also that yesterday it must have been half the size it was today, and the day before yesterday a quarter the size. If we represent such an object in Figure 1 or Figure 2 it would look something like a trumpet horn.

Where difference systems exist, and where the patterns can be perceived, we have, of course, great predictive power. This is why celestial mechanics is so spectacularly successful in prediction and why such things as eclipses for instance can be predicted to the second or less. Unfortunately celestial mechanics is almost the only good example of difference systems in nature. Man has been able to simulate a good many systems in the laboratory, for instance, in chemical reactions. Even at the level of the lithosphere we cannot predict earthquakes, at the level of the hydrosphere we cannot predict floods, at the level of the atmosphere we cannot predict the weather with anything like the success with which we can predict eclipses. If these are difference systems the equations are far more complicated and such a high order that up to now they have not been discovered. There may be reason to suppose indeed, however, that these are not difference systems at all, or at least if they are they have strong random elements in them, so that a number pulled of a hat, as it were, is constantly added to the total.

If the state of the system today depends not merely on yesterday but on the day before yesterday, we have a difference system of the second order. Here we have to know two initial states of the system before we can predict its course. Thus if we know yesterday and today we can predict tomorrow. Now knowing today and tomorrow we can predict the day after tomorrow. Knowing tomorrow and the day after tomorrow we can predict the day after that and so on. Similarly if we need to know three successive states of the system before we can predict a fourth, the system is of the third degree.. If we need to know n such successive states before we can predict the $n + 1$, the system is of the n^{th} degree. It is an astonishing tribute to the economy of nature that most of the equations of celestial mechanics are of the second degree and it is only for rather odd celestial bodies that we may have to go to the third degree. As we move into biological social systems, however, the complexity of the dynamic patterns become so great that difference systems are only useful as very first approximations and even in economics where they have been used most they have to be interpreted with the utmost care.

Even where explicit equations cannot be derived for difference or differential systems, we can often perceive regularities or patterns in the space-time continuum from simple observation. I have sometimes called these "wallpaper systems". If we have wallpaper on a room with a repeatable pattern, the pattern can usually be detected and we have a fair confidence in predicting that it will continue behind the pictures or the furniture where it is not actually visible. Similarly we can detect "wallpaper patterns" in our space-time continuum. The most striking of these is the pattern of human life itself which exhibits an extraordinary uniformity as we go from conception through the growth of the fetus to birth, from the growth of the baby into childhood to adolescence to adulthood and finally to old age and death. This pattern is so regular that if we know the age of any human being we have a great deal of information about him and can predict roughly what he will look like. Any two people of age seventy, for instance, are much more alike than either of them would be like a baby of six months. Babies of six months are even more alike! Similar wallpaper patterns apply to many objects such as automobiles, clothing, as well as to all living creatures. We can predict with a great deal of confidence, for instance, that an acorn if it germinates and survives will grow up into an oak, not into an elm. We predict likewise a kitten will grow up into a cat, not into a dog.

In social organizations, unfortunately for our powers of prediction, life patterns are not so regular and attempts at social prediction, which are based on the assumption that social organizations or even larger societies "age" in the same way that biological organisms do, have not been very successful. Aging processes can of course be observed in organizations and even perhaps in total societies, but they are much less regular than in the biological world. Organizations often renew their youth as a new set of decision makers takes over. Sometime by contrast they age rather fast and even pass out of existence because of an inability on the part of their decision makers to adapt to new circumstances. Biological analogies indeed while they are useful must be used with the utmost care in the interpretation of social systems, which are really much more complex. In biological systems the life pattern is very largely built into the information code of the genetic structure. In social systems it is much harder to identify a clear genetic structure and the patterns of development are likewise much more subject to environmental disturbance. We have the same problem in the generalizing from animal behavior to human behavior, which seems to have become a very popular sport lately. The patterns of animal behavior can often suggest fruitful lines of inquiry into human behavior, but man is a system of a substattially higher order of complexity than even the most intelligent animal, simply because of the capacity of his nervous system, his ability to use language, and his image of the future. Generaliza tions from animal behavior to human behavior therefore are as dangerous as applying generalizations derived from the study of the wheelbarrow direct to the jet plane.

Another type of dynamic model of great importance in both biological and social sciences is the evoltuionary model. All evolutionary models involve concepts of mutation and selection, that is, the creation of new types of organization on the one hand and the disappearance of existing types on the other. It is not easy to put content into evolutionary theory however. The famous principle of the survival of the fittest tells us very little because if we ask what the fit are fit for the answer is to survive. If we are not careful therefore evolution simply becomes the principle of the survival of the surviving, which does not tell us very much. If evolutionary theory is to be spelled out, therefore, it must rest first on population analysis. This can be done as a first approximation at any rate as in terms of difference systems. A population is a number of individuals, each of which conforms to a common definition. In any one period the number of births is the number of new individuals which have come to conform to this definition and the number of deaths is the number of individuals who cease to conform to it. Fundamental to population theory is the principle which I have sometimes called the "bathtub theorem" that the increase in the numbers of a population in any period must be equal to the number of births minus the number of deaths. If we think of a population as water in the bathtub the flow of births is the amount of water flowing in and the flow of deaths is the amount of water flowing out, and the difference between these two is the increase in the amount of water in the bathtub. In order to get a dynamic analysis of a population we must establish stable relationships between the number of births and the number of deaths and either the existing state of the population or its state in previous periods, or the state of other populations in the system. A simple form of population analysis is that which assumes that the birth and death rates of particular age groups are constant (what is called "age-specific" birth or death rates) then if we are given the age composition of any population we can deduce the number of births and the number of deaths in each age group in the next time period and hence we can derive the structure of the population at the end of that period and as this process can be repeated indefinitely the whole future course of the population can be projected. If we are to put any content into evolutionary dynamics we must consider the birth and death rates of each population as a function not only of its own structure but of the structure of other populations around it. Thus, we might suppose that when rabbits are plentiful the population of wolves will increase and that when rabbits are scarce the population of wolves will diminish. Under fairly plausible assumptions such a system will lead to an ecological equilibrium in which the numbers of each population is consistent with the numbers of all the others. Ecological equilibriums are quite common in nature. In the biological world, for instance, we disturb a particular species in a pond, a prairie, or a forest, and if the disturbance is not too great, the previous equilibrium often reasserts itself in a fairly short time.

Evolution is closely related to ecological succession, that is, to a change in the ecological equilibrium as irreversible processes take place. In the biological world ecological succession takes place from a great many causes; from the filling up of lakes as the sediments are washed into them, from the succession of plants species as the life process of one species changes the environment in such a way as to increase or diminish the success both of itself and of others, and so on. By evolution in a larger sense we mean ecological succession which is the result of genetic mutation. A successful genetic mutation results in a population which can occupy a larger niche in the ecological equilibrium system and correspondingly of course may force other populations to occupy smaller niches. Where conditions under ecological equilibrium are unfavorable enough an old population may disappear altogether. It shrinks in numbers below the point where it can reproduce itself.

These ecological and evolutionary concepts are very useful in social systems simply because social systems like biological systems consist of populations of different species such as commodities, occupations, personality types, and forms of organization. Just as fish, frogs, vegetation, and minerals form an ecological system in nature so automobiles, plumbers, Seventh-Day Adventists, Americans, and banks form an ecological system in society, along with all the other innumerable social species. The concept of general equilibrium, whether an ecological system, or a Walrasian price system, or that of national war industries, are all special cases of the general principle that everything depends on everything else. This principle can be expressed as a system of n equations with n unknowns and if these equations are will behaved a solution of the system may be found in which all the quantities of the system are mutually compatable.

The concept of ecological succession likewise applies in society as well as it does in the biological realm. Soil erosion and climatic change can destroy societies as effectively as they can destroy natural ecosystems. The accumulation of knowledge changes the composition and productivity of society just as the process of genetic mutation changes the composition of the biological world. It is not too far-fetched, indeed, to describe the whole evolutionary process as a process of the growth of knowledge. Helium in some sense "knows" more than hydrogen or at least is more improbable, and the road from hydrogen to man or even to the Federal Reserve System is a continuing process of development of organizations that have increasing complexity and improbability.

The parallels between the biological and social evoltuion are very instructive. The differences are also very important and must not be neglected. In biological evolution the distinction between the genotype

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and the phenotype is very sharp. Roughly speaking we may say that the genotype mutates and the phenotype selects. In social systems the distinction between the genotype and the phenotype has some meaning, but is less clear. We can think of organizations, for instance, as phenotypes whereas the ideas, the entrepreneurs, and the prophets which give rise to them are genotypes. Nevertheless, there is practically nothing in social systems which corresponds to the delightful simplicities of sex. In the world of communications, ideas, and information which is, as it were, the genotype world of the social system there is a process of constant mutation, combination, and recombination which is very much more complex than the processes by which the genes mutate and combine.

The phenotypes of the social system consist of two major categories first, material artifacts such as houses, automobiles, machines, church buildings, clothing and so on and second, organizations such as families, business firms, churches, states, and so on. Organizations and artifacts are frequently associated. A building, indeed, is usually the material shell of an organization in much the same way as a snail shell is the house for a snail. Thus the American states tend to secrete domed capitols, church organizations secrete church buildings, a university creates a campus, and a family occupies a house. Society, however, is largely populated by social species like the hermit crab, and organizations of all kinds frequently inhabit structures which were built by - and for - others. Organizations must be regarded as the dominant species of social systems. Artifacts can be destroyed, but if the organization remains the artifacts which are associated with it will be recreated, whereas if the organization is destroyed, the artifacts will fall into ruins and will not be replaced, as the ruins of many ancient temples and cities demonstrate.

An organization is a structure of roles rather than of people, just as a biological organism is a structure of chemical roles, rather than of particular atoms or molecules. An organization is, therefore, an "open system" in the language of General Systems for it maintains a structure of roles in the presence of a continual throughput of people as role occupants. In a university, for instance, freshmen are continually becoming sophomores and replaced by new entrants. Professors are replaced as they retire or leave. The president is replaced when he leaves, and for each role indeed in the whole organization there must be an apparatus for role maintanence; that is, somebody who's job it is to see that each role is filled when it gets empty, or the organizations cannot survive permanently.

When we are looking for the genetic principles of social evolution, therefore, we need to look at those social relationships which are role-creating, for it is these which will establish organizations. I distinguish three broad categories of these role-creating relationships: 1. The threat system, 2. The exchange system, and 3. The integrative system. There is now considerable body of theory applicable to each. A threat system begins when A says to B "you do something nice to me or I will do something nasty to you." If B believes A he may submit, in which case roles are created and an incipient organization is underway. A naked threat like that of the bandit rarely succeeds in organizing more than a temporary organization, as we shall see more clearly later, threats must be legitimated, that is, allied with integrative relationships, if they are to be successful in forming ongoing relationships. Nevertheless, a certain element of threat is present in all organization, even in the most utopian community. It was the threat system by and large which organized the urban revolution, which created the first cities, which created slavery, and which has created weaponry and war.

The exchange relationship is one where A does something for B and B does something for A. There are certain superficial resemblances between threats and exchange; when the bandit says, "Your money, or your life" this looks superficially like an exchange, you give him your money, he gives you your life, but we all recognize this to be something of a fraud. Threats involve discommodities, the exchange in the threat system is the exchange of a commodity for a negative discommodity, that is, not doing something bad. In exchange proper, however, it is commodities, that is, goods which are exchanged. Economics, indeed, is the science of how society is organized through exchange and we know a great deal about this. As Adam Smith pointed out, exchange permits and encourages the division of labor which increases productivity which increases exchange still further, so that we get under the benign impact of exchange a continuous process of development until the evolutionary potential in any particular case is worked out. The threat system creates empire and exchange creates welfare.

The third category of genetic social relationships, the integrative system, is something of a catchall and it should perhaps be broken down into several categories. There are, however, very important social genetic relationships which are not comprised under either threats or exchange. These are characterized mainly by behavior which is motivated by mutually recognized status. A says to B "you do something because I am your father, and you are my child" or "because I am a teacher and you are a student" or "because we both belong to the same church or the same family or the same country or the same human race or because we love each other" and so on. Threat, exchange, and integrative relationships are themselves closely interrelated in general. Indeed it is impossible to create continuing organizations without some sort of integrative structure. The bandit can organize a highly temporary organization but if the organization is to be permanent, he must be a landlord or a tax collector. Similarly, exchange cannot take the place unless there is a minimum degree of trust and community. Similarly threats and exchange frequently create integrative relationships. In a classroom, for instance, there is an integrative relationship in the sense of the mutual acceptance of status so that when the teacher asks the student to do something the student has a strong inclination to comply. These mutually accepted status relationships, however, are not unrelated to an underlying threat system. "If you don't do this paper, you will not get a grade" and an underlying exchange system "I have paid for this course, I might as well get the most out of it." The building up of integrative relationships out of exchange and threats, however, is not inevitable, and if it fails to happen the organizations which are created will be weak and short lived.

A very important aspect of the integrative system in social dynamics is the fact that from time to time it throws up charismatic, prophetic, and entrepreneurial figures who seem to have quite extraordinary evolutionary potential in the creation of new roles. Sometimes, indeed, it is a group of people who perform this function. More often it is a group of disciples dominated by a single outstanding figure. The "captain" of industry, the conquering general who becomes emperor, the founder of a religion, the founder of a dynastic family, thecreator of a new discipline or a new science or a new art form or style all have something in common, at least from the point of view of social dynamics. They are capable of putting in motion a train of consequences which seems to go far beyond the initial impulse. This charismatic dynamic if we may give it a name is peculiarly a property of the symbolic system. This is the system unfortunately which is little understood and in which our powers of prediction are virtually nil.

To round out this very sketchy survey we must take a brief look at the role of dynamic equilibrium systems or cybernetic systems in the social dynamic process. A cybernetic system is one with stabilizing feedback. Familiar examples in the mechanical world are the governor of an engine and the thermostat of a heating system and a large number of mechanisms which ensure the homeostasis of the body. Systems of this sort cover a huge range of natural phenomena and they are of great importance in social systems. The equilibrium of the system of relative prices, for instance, in economics, is essentially a cybernetic system, for if prices diverge from the equilibrium, forces are brought into play largely of an informational nature to bring the system back to equilibrium again. Where regular cyclical situations are observed in nature a cybernetic system is almost always at work. If the feedbacks have too much of a lag or are too sensitive the intensity of the cycle may be uncomfortably great; the system gets "wow" or "flutter". The business cycle in economic life is a phenomenon of this kind. There is even some evidence that the war-peace cycle may be somewhat similar and may be mainly due to poor timing in feedback. If the feedback is too small, of course, the system loses its equilibrium properties and becomes largely subject to random processes. Wherever there are nonrandom dynamic processes, indeed, in nature we can suspect a cybernetic apparatus of some kind, even, for instance, in the life processes or "creodes" which we have previously noted. If feedback becomes positive beyond a certain critical level it becomes destabilizing. With negative feedback, if the system diverges from equilibrium the feedback operates to reverse its dynamic direction, and hence to bring it back. Under disequilibrating feedback, however, the feedback operates to intensify the divergence and to drive the system further and further from any position of equilibrium which it may have had.

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Whenever we have "explosive" systems, therefore, which do not seem to exhibit any equilibrium at all, we can suspect that disequilibrating feedback is at work. The growth of knowledge is a good case in point. The more we know, the easier it is to acquire more knowledge. Hence, once the human race passed that fateful threshold of the knowledge equilibrium at which the creation of knowledge just balanced the loss through death, an explosive process was set up of which indeed there seems to be no end in sight. In economic systems inflation and deflation can similarly be explosive processes. If the tax system, for instance, is deficient or is based on last year's income, so that a government cannot close the gap between its receipts and its expenditures, the quantity of money will continually increase. As it increases, the gap between expenditure and receipts will grow further and the quantity of money will increase still faster. A somewhat similar phenomenon develops in the reverse direction in deflation and depression. At the individual level, mental ill health or even physical ill health is often the result of systems of disequilibrating feedback. A neurosis feeds on the very illusions which it develops. Thus, disequilibrating feedback clearly is an important explanation in many social dynamic processes, especially those in which the developmental process, whether for good or for ill, seems to proceed almost without limit.

We have by no means exhausted the implications even on the very sketchy body of theory presented here and there are whole ranges of phenomenon which it does not cover. Nevertheless, I have tried to demonstrate that there is a body of general social theory especially of social dynamics and that around this core a reorganization of the social sciences is already in process to the point indeed where its whole disciplinary structure can be called in question. The plain fact is that all the social sciences are studying the same thing-which is the social system. They are not divided from each other by any difference in systems level such as divides all of them from, shall we say, physiology. At the theoretical level the social sciences are divided from each other mainly by the aspect or point of view from which they study the total system. Thus, economics studies it from the point of view of how it is organized by exchange. Political science studies it from how it is organized by what might be called legitimated threat. Sociology focuses mainly on integrative relationships or on the organizational aspects of the total system. There is a certain amount of dividing up of the empirical subject matter and of the orgazizations which are studied. Thus banks, on the whole, are studied in the departments of economics, whereas municipal governments are studied in the departments of political science. Families are studied in the departments of sociology and tribes in departments of anthropology. This division, however, is largely of historical origin and the serious study of any organization would involve all the social sciences. We recognize this first perhaps in the study of the labor movement where it became clear at least a generation ago that the labor union and the whole industrial relationship was a matter not merely of economics, though wages are very important, but also of psychology, social psychology, sociology, and political science. It is only in the last ten years that we have begun to study the international system from an integrated interdisciplinary point of view and we still do not study the financial system and financial institutions from this point of view.

Even though, therefore, the existing divisions of the social sciences are by no means arbitrary, and exist for good historical reasons, one wonders whether at some points it has now become a hindrance rather than a help. It is interesting to speculate indeed how we might break up the study of the social system into different ways. The difference between small groups and large groups, between small organizations and large organizations, between what economists call the micro and the macro is closer to being a difference in systems level of subject matter than any of the existing divisions or departments. It is hard, however, to challenge an established order with so many vested interests and so much accumulated legitimacy, and I would certainly not at this point advocate the abolition of departments of economics, political science, sociology, and so on. Least of all would I advocate dissolving the American Economic Association! The Social Science Research Council has done something to foster the interdisciplinary study of problems but the fact that it does not really have any professional and departmental organization, especially in the universities, makes it a relatively weak organization.

The critical question, however, is not the particular form of organization, but whether it will be possible say in the next fifty years to mobilize a substantial intellectual resource behind the problem of developing a general social science, not only with an adequate theoretical structure, an adequate machinery for teaching and transmission, an adequate information collection and processing system which we do not now even approximate except perhaps in certain fields of economics, and an adequate language for communicating not only with other social sciences but also with the outside world. This is a task to challenge the imagination of the human race and if it can fire enough imaginations it will be accomplished. It should start, of course, in the social sciences themselves, with existing resources, meager as they are. We must develop, indeed, following our own theory a process of disequilibrating feedback

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concentrating our efforts in enterprises with fairly short payoffs at first so that those who hold the purse strings in the foundations and in governments and even in universities can get the message. Not only social scientists but historians and geographers must be involved in the process. The study of history, thanks to computers which have a strong comparative advantage in memory, is, I believe, on the verge of a revolutionary change which will have profound impacts on all the social sciences. What we may see, indeed, is an amalgamation of history and geography as the study and improvement of the record of the space-time continuum in the "data bank" and ever more refined methods of perceiving regularities within it. The main function of the other social sciences may well be from the point of view of their empirical work to improve the raw material of history, to create a record which is less fragmented and more representative on the whole than the historical record that we have to date. To return then to our opening theme, the great work of the intellect is to mine the stratified and contorted mass of the space-time continuum. It is the business of the historian to work over the old tailings. It is the business of the social scientists to develop new mining machinery for future deposits, so that as we proceed from the face of the present into the future the record becomes progressively more significant. Fifty years in an effort of this kind might produce a knowledge revolution in the social system which would have more impact on the whole welfare of mankind than anything else which has been done before it.

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